

On the Non-existence of Polarizing Silica in the Organic Kingdoms.
By Prof. J. W. BAILEY.

It is now more than twenty years since Sir David Brewster announced the existence of polarizing or doubly refractive silica in the cuticle of *Equisetum*, and in that of some of the grasses. In Lindley's 'Natural System of Botany,' the following account of Brewster's experiments is given:—"On subjecting a portion of the cuticle of *Equisetum hyemale* to the analysis of polarized light under a high magnifying power, Brewster detected a beautiful arrangement of the siliceous particles, which are distributed in two lines parallel to the axis of the stem and extending over the whole surface. * * * * Brewster also observed the remarkable fact that each particle has a regular axis of double refraction. In the straw and chaff of wheat, barley, oats and rye, he noticed analogous phænomena."

In Quekett's 'Treatise on the Microscope,' 3rd edit. p. 358, directions are given for preparing the siliceous cuticle of *Equisetum hyemale* for microscopic examination, by boiling in strong nitric acid, and it is added that "in balsam it forms a beautiful object for polarized light." Similar directions are given for preparing the silica in the chaff of wheat, oats, &c.

As these statements are contained in the last editions of each of the above-mentioned works, it is evident that no contradiction of the error involved in them has been pointed out; yet, notwithstanding the high authority on which they rest, the statements, so far as the polarizing action of the silica is concerned, are wholly erroneous. If the cuticle of the above-mentioned plants is completely deprived of its carbonaceous tissues, it will be found wholly devoid of action on polarized light, and any preparation of the cuticle which is found to affect polarized light, will also be found to blacken when heated in concentrated sulphuric acid, and if then decarbonized by throwing into the hot acid solution a little chlorate of potassa, the residual silica shows no signs of action under the polariscope, either alone or with the selenite plate, although it still retains the forms of the cells, stomata, &c.

It is clear then that the error in the above statements has been caused by the imperfect removal of the dense carbonaceous tissues which are deposited beneath the silica. I have examined several species of *Equisetum* and a large number of plants of the Grass tribe which are most remarkable for their siliceous cuticles, but have found no trace of any action upon polarized light, when the carbonaceous matter was removed. But it is unnecessary to resort to artificial preparations to prove the correctness of my statements. Nature has made her own preparations, and deposited them by myriads beneath every peat-bog, where may be found not only the siliceous shells of the Diatoms and the spicules of the freshwater sponges, but also a large number of the siliceous parts of the grasses, sedges, &c. Ehrenberg has shown*, and I can confirm his statements, that the

* Berlin Monthly Reports, May 1848.

silica in these Phytolitharia, as well as in the Diatomaceæ, Polycystinæ and Spongiolites, is not doubly refractive. He makes an exception in the case of the shell of *Arachnoidiscus*, but my own experiments prove that when properly cleaned this shell forms no exception. As I have shown above that the silica in the cuticle of the *Equisetum* and Grasses agrees with that in the lower tribes in characters, I think the conclusion is warranted, that doubly refractive silica has no existence in the organic world.—*Silliman's American Journal for May 1856*, p. 357.

METEOROLOGICAL OBSERVATIONS FOR MAY 1856.

Chiswick.—May 1. Overcast : cold showers, partly hail : clear and cold. 2. Quite clear : cloudy : frosty at night. 3. Cloudy and cold : showery. 4. Overcast : cloudy : clear, with sharp frost at night. 5. Frosty early A.M. : cloudy and cold. 6. Fine : cloudy and cold : rain. 7. Cold rain. 8. Densely clouded : cold north wind. 9. Heavy clouds. 10. Uniformly overcast : fine. 11. Light haze : fine : cloudy. 12. Uniform haze : rain. 13. Rain : cloudy. 14. Heavy showers. 15. Fine : showers, with some hail. 16. Fine. 17. Cloudy. 18. Boisterous, with rain and hail. 19. Very fine. 20. Very fine : slight frost. 21. Fine : rain. 22. Rain. 23. Cloudy : fine. 24. Fine. 25. Cloudy : rain. 26. Fine. 27. Very fine : heavy rain at night. 28. Cloudy : very fine. 29. Hazy : cloudy : fine. 30. Cloudy and cold. 31. Rain.

Mean temperature of the month	50°·09
Mean temperature of May 1855	48·78
Mean temperature of May for the last thirty years	53·55
Average amount of rain in May	1·852 inches.

Boston.—May 1. Cloudy : rain and sleet P.M. 2, 3. Cloudy : rain and hail P.M. 4, 5. Cloudy. 6. Cloudy : hail and snow A.M. 7. Cloudy. 8. Cloudy : rain A.M. 9, 10. Cloudy. 11. Fine. 12, 13. Cloudy. 14. Cloudy : rain with thunder P.M. 15, 16. Cloudy. 17. Cloudy : rain P.M. 18. Cloudy : rain A.M. and P.M. 19. Cloudy. 20, 21. Fine. 22. Rain A.M. and P.M. 23. Fine : rain and thunder P.M. 24. Cloudy : rain A.M. and P.M. 25, 26. Cloudy : rain P.M. 27. Fine : rain P.M. 28. Cloudy : rain A.M. and P.M. 29. Cloudy : 30. Fine. 31. Cloudy : rain P.M.

Sandwick Manse, Orkney.—May 1. Bright A.M. : cloudy P.M. 2. Sleet-showers A.M. : cloudy P.M. 3—5. Cloudy A.M. and P.M. 6. Cloudy A.M. : clear P.M. 7. Clear A.M. and P.M. 8. Cloudy A.M. : clear P.M. 9. Clear A.M. : rain P.M. 10. Cloudy A.M. : drops P.M. 11. Drizzle A.M. : fog P.M. 12. Hazy A.M. : clear, fine P.M. 13. Cloudy A.M. and P.M. 14. Cloudy A.M. : rain P.M. 15. Cloudy A.M. drops P.M. 16. Bright A.M. : cloudy P.M. 17. Clear, fine A.M. : cloudy, fine P.M. 18. Showers, bright A.M. : showers P.M. 19. Cloudy A.M. : showers P.M. 20. Bright A.M. : clear P.M. 21, 22. Bright A.M. : cloudy P.M. 23, 24. Cloudy A.M. and P.M. 25. Clear A.M. and P.M. 26, 27. Cloudy A.M. and P.M. 28. Bright A.M. : cloudy P.M. 29—31. Clear A.M. and P.M.

Mean temperature of May for previous twenty-nine years ...	47°·85
Mean temperature of this month	46·83
Mean temperature of May 1855	43·81
Average quantity of rain in May for fifteen previous years ...	1·66 inches.

The great drought continues ; the rain during the last three months being less than the average for May alone, which is our driest month, and not half the quantity that fell in March alone last year.